

tion in other media; and, lastly, whether by any means the *Bacillus* might again acquire the power of producing the disease—these are questions which can only be determined by further experiment.

- X. "On the Miocene Plants discovered on the Mackenzie River." By Professor OSWALD HEER, of Zürich. Communicated by ROBERT H. SCOTT, F.R.S. Received June 16, 1880.

On his return from his "searching expedition" to Arctic America of the year 1848, Sir John Richardson brought to London a box of fossil plant-remains, which he had collected on the Mackenzie River, between Fort Norman and the Great Bear Lake River, in latitude 65° N.

The deposits from whence the specimens were obtained had been discovered by Sir Alexander Mackenzie, in 1785, and visited by Sir J. Franklin and Sir John (then Dr.) Richardson in 1825; but it was not until his second visit that Richardson was able to bring away specimens (Journal, vol. i, p. 186).

This first collection contained seventeen specimens, of which only fourteen allowed of exact determination, but it presented features of great interest, as it gave us the first indications of the character of the Miocene Flora of these inaccessible regions of North America.

The importance of procuring more copious materials for the study of these deposits hardly requires to be stated, and, accordingly, in the year 1871, Mr. Robert H. Scott, F.R.S., and Dr. John Rae, F.R.S. (who had himself accompanied Sir John Richardson on his expedition in 1848, when the first specimens were collected), obtained from the Government Grant Committee the sum of £50 to defray the cost of procuring and forwarding to London a collection of these plant-remains. The actual expenses incurred have, however, fallen far short of the amount received.

The kind offices of Mr. W. Hardisty, Chief Factor of the Hudson's Bay Company's Service, were enlisted for the task, which was not an easy one to carry out. The locality is distant from any inhabited port, and is merely passed by the boats on their annual trading journeys up and down the river, when the men are fully employed in making the best use they can of the short period available for navigation, and have but little time to look for fossils.

More than one attempt was made to send boxes to London; but as this involved a long journey by boat before they reached the port of shipment, it is not to be wondered at that two or three cases failed to reach their destination. At last, in the summer of 1879, Dr. Rae learnt that a box of fossils, addressed to him, was lying at Manitoba

which eventually was sent by rail to New York, and thence by steamer to London, its contents reaching me in the course of the present spring (1880).

The specimens consisted of silicified wood with a number of leaves, partly in soft, but partly also in baked clay. The nature of the stone corresponds exactly with that in which Richardson's specimens are embedded; and as, of the fourteen species represented in the new collection, seven are found in Richardson's, it is evident that all the specimens come from the same locality. The same is also true of a few plant fossils recently submitted to me, which have been received by Mr. Scott from the Bishop of Athabasca, who, before leaving England, had readily consented to do what he could to forward the study of the geology of this part of his immense diocese.

If we summarise all the known facts of the Fossil Flora known to occur on the Mackenzie River, we find that there are twenty-three species, of which six are widely disseminated in the Miocene deposits of Europe:—*Taxodium distichum miocenum*, *Glyptostrobus Ungerii*, *Sequoia Langsdorfii*, *Corylus M'Quarrii*, *Platanus aceroides*, and *Juglans acuminata*.

Not a single one of the species is found in the Eocene of Europe.

The Mackenzie Flora contains six species present also in the Brown-coal Flora of Alaska, viz., *Tax. distichum*, *Glypt. Ungerii*, *Seq. Langsd.*, *Coryl. M'Quar.*, *Jugl. acuminata*, and *Viburnum Nordenskiöldi*.

Eight appear also in the Flora of Saghalien:—*Tax. dist.*, *Glypt. Ung.*, *Sequ. Langsd.*, *Corylus M'Quar.*, *Jugl. acum.*, *Hedera M'Clurii*, *Quercus Olafseni*, and *Magnolia Nordenskiöldi*.

The Flora exhibits just as close a connexion with that of the Arctic Miocene beds. Thirteen species from Greenland, fourteen from Spitzbergen, five from Grinnell Land, and four from Iceland make their appearance.

In Canada, to the south of the Mackenzie River, in lat. 49° N., Tertiary plants have been found in some localities, e.g., at Porcupine Creek, at Great Valley, and on the Milk River. The last-mentioned localities have yielded only a few species, and Professor Dawson has determined fifteen from Porcupine Creek.* Of these six are still existing, and one of these species (*Onoclea sensibilis*, L.) has also been found in the Miocene Tuffs of Mull, in Scotland, and at Fort Union. To these should be added three species known as Miocene, *Glyptostrobus Europæus*, *Sequoia Langsdorfii*, and *Populus Richardsoni*.

Not one of the plants described by Dawson occurs in the Eocene of Europe, and in the United States themselves four of the species have been found in the Miocene, while only one (the *Sequoia*) is possibly admissible as Eocene.

* Vide "Report on the Geology and Resources of the Region in the vicinity of the 49th Parallel." By G. M. Dawson. Page 328.

When we, moreover, consider that, according to Dawson's determinations, one-half the species agree with living forms, while not an individual existing plant is known to occur in the Eocene of Europe, we must certainly range these Porcupine Creek beds with the Miocene and not with the Eocene, where Professor Dawson places them.

Professor Dawson was led to this incorrect conclusion by some remains of Vertebrata found at Milk River. These, however, occur on a lower horizon than the plant beds on the Porcupine River, as the author himself points out (*loc. cit.*, p. 152), and these Milk River beds *may* be Eocene.

Two species are common to the Mackenzie River and Porcupine Creek, and when Professor Dawson, from this circumstance, concludes that the plants from the former locality are Eocene, he has reasoned on entirely mistaken grounds. The same remark may be made when he assigns the Tertiary Flora of the Arctic regions to the Lower Eocene.

The plant-remains found at Porcupine Creek, on the Mackenzie River, and in Alaska belong to the northern Miocene Flora of North America, which has a considerable number of species in common with the Miocene Flora of the Frigid Zone, and belongs to a period at which in the Rocky Mountains, in Greenland, and Iceland, as well as in Scotland, Ireland, and on the continent of Europe extensive volcanic eruptions occurred, in which these plant-remains are occasionally found embedded.

If we compare the plants from the Mackenzie River with the Tertiary Flora of the United States, which has been very thoroughly worked up by Professor L. Lesquereux,* we find eight species in common, viz., *Tax. dist.*, *Sequ. Langsd.*, *Glypt. Ung.*, *Cor. M'Quar.*, *Pop. Richards.*, *Populus Arctica*, *Betula macrophylla*, and *Platanus aceroides* (?).

All these species appear in the Miocene beds of America, but one of them (*Pop. Arctica*) reaches down into the Oligocene and a second (the *Sequoia*) possibly even down to the Eocene.

The comparison with the Tertiary Flora of the United States, therefore, tends to place the white clay beds of the Mackenzie River among the Miocene, and accordingly corroborates the result based on the proved agreement of the fossils therein contained with the Miocene Flora of Europe and of the Arctic regions.

The specimens of silicified wood have been submitted for microscopic examination to M. C. Schröter, Assistant at the Botanical Laboratory of the Polytechnicum of Zürich, and I shall hope to communicate a notice of any results he may attain to the Society.

* L. Lesquereux, "Contributions to the Fossil Flora of the Western Territories. II. The Tertiary Flora." Washington, 1878.